

$$\begin{aligned}
 \text{3.1} \quad \lim_{x \rightarrow 0} \frac{\cos(\alpha x) - \cos(\beta x)}{x^2} &= \lim_{x \rightarrow 0} \frac{-2 \sin \frac{\alpha x + \beta x}{2} \sin \frac{\alpha x - \beta x}{2}}{x^2} = \lim_{x \rightarrow 0} \frac{-2 \sin \frac{x(\alpha + \beta)}{2} \sin \frac{x(\alpha - \beta)}{2}}{x^2} \cdot \frac{\frac{\alpha + \beta}{2}, \frac{\alpha - \beta}{2}}{\frac{\alpha + \beta}{2}, \frac{\alpha - \beta}{2}} \\
 &= \lim_{x \rightarrow 0} \frac{-2 \sin \frac{x(\alpha + \beta)}{2}}{\frac{x(\alpha + \beta)}{2}} \cdot \frac{\sin \frac{x(\alpha - \beta)}{2}}{\frac{x(\alpha - \beta)}{2}} \cdot \frac{\frac{\alpha^2 - \beta^2}{4}}{\frac{\alpha^2 - \beta^2}{4}} = -2 \cdot \frac{\alpha^2 - \beta^2}{4} = \frac{\beta^2 - \alpha^2}{2}
 \end{aligned}$$